

Explanation of Significant Differences

for the

100-NR-1 and 100-NR-2 Operable Units

Interim Remedial Action Record of Decision

Hanford Site

Benton County, Washington

August 2013

SITE NAME AND LOCATION

U.S. Department of Energy 100-NR-1 Operable Unit
Hanford Site
Benton County, Washington

INTRODUCTION TO THE SITE AND STATEMENT OF PURPOSE

Remediation of waste sites at the 100-N Area of the Hanford Site (Figure 1) is being conducted under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA, 42 U.S.C. 9601 et seq.) in accordance with two Interim Action Records of Decision (RODs). One ROD, issued in January 2000, selects remedial actions associated with two *Resource Conservation and Recovery Act of 1976* (RCRA)-regulated units and an associated waste site within the 100-N Area. The other ROD (and the subject of this Explanation of Significant Difference [ESD]) addresses waste sites, unplanned releases, spills, and associated piping in the 100-NR-1 Operable Unit (OU) and underlying groundwater, designated as the 100-NR-2 OU. The Washington State Department of Ecology (Ecology – the lead regulatory agency), the U.S. Environmental Protection Agency (EPA – the non-lead regulatory agency), and the U.S. Department of Energy (DOE – the responsible agency), hereinafter referred to as the Tri-Parties, are issuing this ESD to provide public notice of significant changes to the ROD for the 100-NR-1 OU located on the Hanford Site (Figure 1). The ROD is as follows:

- The *Interim Remedial Action Record of Decision for the 100-NR-1 and 100-NR-2 Operable Units, Hanford Site, Benton County, Washington* (100-NR-1/100-NR-2 ROD) (EPA 1999). This ROD was approved on September 30, 1999, and revised via ESDs in 2003 (EPA 2003) and 2011 (EPA 2011).

The location of the OU addressed in the ROD is shown in Figure 1.

An ESD is required when a remedial action differs significantly from the remedy selected in the ROD with respect to scope, performance, or cost, but the overall cleanup approach is not fundamentally altered. Under this ESD, two additional waste sites will be remediated via the remove, treat (if necessary), and dispose (RTD) remedy selected in the original ROD. Inclusion of these additional waste sites will significantly change the scope of the remedy, but will not fundamentally alter the cleanup approach selected in the 100-NR-1/100-NR-2 ROD. The ROD, as amended by this ESD, remains protective and continues to meet applicable or relevant and appropriate requirements (ARARs) as determined at the time of issuance of the ROD.

Statutory Citation for an Explanation of Significant Differences

The Tri-Parties are issuing this ESD in accordance with Section 117(c) of CERCLA and Section 300.435(c)(2)(i) of the “National Oil and Hazardous Substances Pollution Contingency Plan” (NCP) (40 CFR 300). This ESD provides public notice of the changes, identified herein,

to the remedy selected in the ROD. DOE will publish notice of the availability and a brief description of this ESD, which includes the reasons for the differences, in the *Tri-City Herald*.

In accordance with Section 300.435(c)(2)(i)(A) and 300.825(a)(2) of the NCP, this ESD will become part of the Administrative Record for the 100-NR-1/100-NR-2 ROD, which is available for review at the following location:

U.S. Department of Energy, Richland Operations Office
Administrative Record
2440 Stevens Center Place, Room 1101
Richland, Washington 99354
Telephone: (509) 376-2530
URL: <http://www2.hanford.gov/arpir/>
Hours of operation, Monday through Thursday 7:00 am – 4:40 pm

This ESD will also be available electronically for review at the following information repositories:

Public Information Repositories

Public Access Room	Phone: (509) 376-2530
2440 Stevens Center, Room 1101	Fax: (509) 376-4989
P.O. Box 950, Mail Stop H6-08	POC: Heather Childers
Richland, WA 99354	URL: http://www2.hanford.gov/arpir/

University of Washington	Phone: (206) 543-0242
Suzzallo Library	
P.O. Box 352900	
Seattle, WA 98105-2900	

DOE-RL Public Reading Room	Phone: (509) 372-7443
Washington State University	
Consolidated Information Center	
Room 101L	
2770 University Drive	
Richland, WA 99354	

Gonzaga University
Foley Center
502 E Boone Avenue
Spokane, WA 99258-0001

Phone: (509) 323-3834

Portland State University
Branford Price Millar Library
1875 SW Park Avenue
Portland, OR 97207-1151

Phone: (503) 725-4709

SITE HISTORY, CONTAMINATION, AND SELECTED REMEDY

Nine water-cooled, graphite-moderated reactors were constructed along the Columbia River at the Hanford Site between 1943 and 1963. The 105-N Reactor (N Reactor), the last plutonium production reactor to be built at Hanford, is situated in the 100 Area in the northern part of the Hanford Site on a broad strip of land along the Columbia River about 48 km (30 mi) northwest of the city of Richland, Washington. The N Reactor differs from the other reactors at Hanford, not only because of its closed-loop cooling system, but because it was designed as a dual-purpose reactor capable of producing both special nuclear material and steam generation for electrical power.

The N Reactor operated between 1963 and 1987. Byproduct steam generated from reactor operation was used to produce electricity in the adjacent Hanford Generating Plant (HGP), a Bonneville Power Administration switching station. The N Reactor went into production in December 1963. The HGP was completed and started producing electrical power in April 1966. Both the reactor and the generating plant operated continuously, except during periodic shutdowns for maintenance and repairs, until January 1987. The reactor was retired in October 1989 and was permanently shut down in October 1991.

Activities conducted in support of operation of the nine reactors within the 100 Area resulted in the creation of hundreds of waste sites and contamination of the soil and groundwater. Primary contaminants include radionuclides and inorganic constituents. In November 1989, the 100 Area was listed on the National Priorities List under CERCLA. Since then, sampling and remediation activities have been ongoing in the 100 Area, and several interim remedial action RODs have been issued to address cleanup of contaminated soil, structures, and debris.

Two CERCLA interim remedial action RODs have been issued for the 100-N Area. One, issued in January 2000, addresses cleanup of contaminated soils, structures, and pipelines associated with two RCRA treatment, storage, and disposal units and an associated waste site. The other CERCLA interim remedial action ROD (the 100-NR-1/100-NR-2 ROD [EPA 1999]) was issued in September 1999 and addresses cleanup of 100-NR-1 OU source waste sites (e.g., contaminated soil, in-ground structures, and debris disposal waste sites) as well as the underlying groundwater (the 100-NR-2 OU). It is the 100-NR-1 portion of the 1999 ROD that is being

significantly changed by this ESD. The selected remedy for the 100-NR-1 source waste sites (excluding the deep and shallow petroleum-contaminated waste sites and shoreline waste sites) established in the ROD consists of the following components:

- Per the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1989), DOE is required to submit the remedial design report, remedial action work plan, and sampling and analysis plan as primary documents. These documents and associated documents concerning the planning and implementation of remedial design and remedial action shall be submitted to Ecology for approval prior to the initiation of remediation. The 100 Area remedial design report and remedial action work plan may be revised as an alternative to submitting new documents. All work required under this approved remedial action must be done in accordance with approved plans and ARARs.
- Prior to beginning remedial action or excavation, a cultural and natural resources review will be conducted.
- Any uncontaminated overburden that needs to be moved to gain access to contaminated soils will be removed and stockpiled and, to the extent practicable, this overburden will be used for backfilling excavated areas.
- The extent of remediation of the waste sites will be as follows:
 - For remediation of the top 4.6 m (15 ft) below surrounding grade or the bottom of the engineering structure, whichever is deeper, remove until contamination levels are (1) demonstrated to be at or below Model Toxics Control Act (MTCA) Method B levels for nonradioactive chemicals, and achieve 15 mrem/yr above background for radionuclides for rural-residential exposure, and (2) demonstrated to provide protection of the groundwater and Columbia River. Contaminant levels will be reduced so concentrations reaching the groundwater or the Columbia River do not exceed MTCA Method B levels, federal and state maximum contaminant levels, or federal and state ambient water quality criteria, whichever is most restrictive.
 - For waste sites where the engineered structure and/or contaminated soil and debris begins above 4.6 m (15 ft) and extends to below 4.6 m (15 ft), the engineered structure (at a minimum) will be remediated so the contaminant levels are demonstrated to be below MTCA Method B levels for nonradioactive chemicals and the 15 mrem/yr residential dose level and are at levels that provide protection of groundwater and the Columbia River. Any residual contamination present below the engineered structure and at a depth greater than 4.6 m (15 ft) shall be subject to several factors in determining the extent of remediation, including reduction in risk by decay of short-lived radionuclides (half-life less than 30.2 years), protection of human health and the environment, remediation costs, sizing of the Environmental Restoration Disposal Facility (ERDF), worker safety, presence of ecological and cultural resources, the use of institutional controls, and long-term monitoring costs. The extent of remediation must ensure that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. For nonradioactive contaminants, MTCA as it was in effect at the time of the interim action

ROD signature specified that concentrations of residual contaminants in soil are considered protective of groundwater if levels do not exceed 100 times the groundwater cleanup levels established in accordance with WAC 173-340-720 (formerly WAC 173-340). If residual concentrations exceed cleanup levels calculated using the 100 times rule, site-specific modeling will be performed to provide refinement on contaminants found to simulate actual conditions at the waste site. For radionuclides, groundwater and river protection may be demonstrated through a technical evaluation using the computer model RESRAD. The decision of whether to proceed with the remove/dispose alternative below 4.6 m (15 ft) or the bottom of the engineered structure, whichever is deeper, will be made by Ecology on a site-by-site basis. A public comment period of no less than thirty (30) days will be required prior to making any determination on the balancing factors.

- The measurement of contaminant levels during remediation will rely on field screening methods. Appropriate confirmational sampling of field screening measurements will be taken to correlate and validate the field screening. After field screening activities have indicated that cleanup levels have been achieved, a more extensive confirmational sampling program will be undertaken that routinely achieves higher levels of quality assurance and quality control that will support the issuance of an interim remedy CERCLA closeout report for the waste site.
- After a site has been demonstrated to achieve cleanup levels for remedial action objectives, it will be backfilled and revegetated. To the extent practicable, removed and stockpiled uncontaminated overburden will be used for backfilling of excavated areas. Revegetation plans will be developed as part of remedial design activities. Efforts will be made to avoid or minimize impacts to natural resources during remedial activities, and the Natural Resource Trustees and Native American Tribes will be consulted during mitigation and restoration activities.
- Treatment of excavated soils will be conducted before disposal, as required, to meet RCRA land disposal restrictions and the ERDF waste acceptance criteria.
- Excavated contaminated soils and structures will be transported to ERDF for disposal. Excavation activities will follow all appropriate construction practices for excavation and transportation of hazardous materials and will follow as low as reasonably achievable (ALARA) practices for remediation workers. Dust suppression during excavation, transportation, and disposal will be implemented as necessary.
- Post-remediation monitoring of the vadose zone and groundwater will be performed to confirm the effectiveness of remediation efforts and accuracy of modeling predictions associated with the selected remedy.
- Institutional controls and long-term monitoring will be required for waste sites where wastes are left in place and preclude an unrestricted land use. Institutional controls selected as part of the remedy are designed to be consistent with the interim action nature of this ROD. Additional measures may be necessary to ensure long-term viability of institutional controls

if the final remedial actions selected for the 100 Area do not allow for unrestricted land use. Any additional controls will be specified as part of the final remedy. The following institutional controls are required as part of this interim action:

- DOE will continue to use a badging program and control access to the waste sites associated with this ROD for the duration of the interim action. Visitors entering any of the waste sites associated with this Interim Action ROD are required to be escorted at all times.
 - DOE will utilize the onsite excavation permit process to control land use, well drilling, and excavation of soil within the 100 Area OUs to prohibit any drilling or excavation except as approved by Ecology.
 - DOE will maintain existing signs prohibiting public access to the shoreline.
 - DOE will provide notification to Ecology upon discovery of any trespassing incidents.
 - Trespassing incidents will be reported to the Benton County Sheriff's Office for investigation and evaluation for possible prosecution.
 - DOE will take the necessary precautions to add access restriction language to any land transfer, sale, or lease of property that the U.S. Government considers appropriate while institutional controls are compulsory; and Ecology will have to approve any access restrictions prior to transfer, sale, or lease.
 - Until final remedy selection, DOE shall not delete or terminate any institutional control requirement established in this Interim Action ROD unless Ecology has provided written concurrence on the deletion or termination and appropriate documentation has been placed in the Administrative Record.
 - DOE will evaluate the implementation and effectiveness of institutional controls for the 100-NR-1 and 100-NR-2 OUs on an annual basis. DOE shall submit a report to Ecology by July 31 of each year summarizing the results of the evaluation for the preceding calendar year. At a minimum, the report shall contain an evaluation of whether or not the institutional control requirements continue to be met and a description of any deficiencies discovered and measures taken to correct problems. (NOTE: The reporting requirement was modified by the 2003 ESD [EPA 2003] and the *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions* [DOE-RL 2002] to establish reporting as part of the CERCLA 5-year review, along with an annual institutional controls assessment update during the EPA and Ecology Area Unit Manager's Meetings every September.)
- Because this is an interim action and wastes will continue to be present in the 100 Area until such time as a final ROD is issued and final remediation objectives are achieved, a five-(5)-year review will be required.

BASIS FOR THE DOCUMENT

As described in the 100-NR-1/100-NR-2 ROD (EPA 1999), the 100-NR-1 OU includes waste sites contaminated as a result of intentional discharges of contaminated liquid effluents to operational facilities such as cribs, neutralization basins, septic systems, and french drains; unplanned releases or leaks from piping systems and storage tanks; and the placement of (sometimes burning) construction debris, used equipment, and office/industrial waste at surface disposal areas. The principal contaminants of concern for the 100-NR-1 OU are radionuclides, metals, and petroleum hydrocarbons.

The 1999 100-NR-1/100-NR-2 ROD selected the remedial action for 81 waste sites and associated pipelines. In addition, an ESD was published in 2011, adding 45 waste sites to the interim remedial action authorized in the original ROD. Since the time of the ROD and the 2011 ESD, two newly discovered waste sites have been identified during ongoing remedial activities at the 100-N Area. Details of these waste sites are included in Table 1. As with the waste sites in the original ROD, these waste sites consist of structures that received intentional discharges. Radionuclides and possibly metals are present at these waste sites. Both of these sites received secondary reactor cooling water, which was known to contain radiological contamination. These contaminants are consistent with the contaminants of concern of other sites included in the original ROD and 2011 ESD and meet the waste profile for disposal at ERDF.

The waste sites addressed in this ESD have been determined by the Tri-Parties to require remediation due to the release of hazardous substances into the environment.

The Tri-Parties have determined through visual inspection, use of process knowledge, and/or sampling (as described in the *100-N Area Sampling and Analysis Plan for CERCLA Waste Sites* [DOE-RL 2007]) that the waste sites identified in Table 1 for RTD are consistent in nature and contaminants with the waste sites identified in the 100-NR-1/100-NR-2 ROD. Therefore, the Tri-Parties conclude that the RTD remedy selected in the ROD is appropriate for addressing cleanup of these waste sites. Adding these waste sites is, however, increasing scope identified in the original ROD. As a consequence, issuance of this ESD is necessary. Cost estimates for the waste sites are listed in Table 1.

DESCRIPTION OF SIGNIFICANT DIFFERENCES

The Tri-Parties have determined that the two waste sites identified in Table 1 contain CERCLA hazardous waste above cleanup levels identified in the 100-NR-1/100-NR-2 ROD, thus requiring remedial action. Additionally, the Tri-Parties conclude that these waste sites are consistent in nature and contaminants with the waste sites identified in the 100-NR-1/100-NR-2 ROD, and therefore the RTD remedy is suitable for remediation of these additional waste sites.

Remediation of these two additional waste sites in accordance with the RTD remedy selected in the 100-NR-1/100-NR-2 ROD represents a significant difference in scope from the original

ROD. The estimated total cost for remediation of the additional waste sites is \$401,500, of which, \$286,300 is estimated for excavation and disposal and \$115,200 is estimated for confirmatory sampling.

Other than the addition to the number of waste sites, implementation of this ESD is not anticipated to result in any change to the expected outcome of remediation as established in the 100-NR-1/100-NR-2 ROD. Remedial action goals, cleanup levels, and ARARs established in the ROD are not being changed via this ESD, nor are implementation aspects associated with the RTD alternative. Subsequent changes to ARARs will be considered at the time of final ROD issuance. Although the number of waste sites to be addressed is increased from 26 (plus pipelines), all waste site remediation actions are expected to be completed by March 2017, prior to the completion date identified in the original 100-NR-1/100-NR-2 ROD.

REGULATORY AGENCY COMMENTS

Ecology and EPA supports issuance of the ESD to the 100-NR-1/100-NR-2 ROD (EPA 1999).

STATUTORY DETERMINATIONS

This remedy satisfies CERCLA Section 121. The interim action remedy selected in the 100-NR-1/100-NR-2 ROD (EPA 1999), as modified by this ESD, remains protective of human health and the environment, complies with applicable or relevant and appropriate federal and state requirements as determined at the time of the ROD, is cost effective, and uses permanent solutions and alternative treatment technologies to the maximum extent practicable. In addition, the remedy employs treatment (as appropriate) to meet land disposal restrictions, as well as the ERDF waste acceptance criteria.

PUBLIC PARTICIPATION

The public participation requirements set forth in 40 CFR 300.435(c)(2)(i) of the NCP are met through the issuance of this ESD, and associated informational sheet, and through notification to the public via newspaper publication placed in the *Tri-City Herald* on September 8, 2013.

REFERENCES

40 CFR 300, “National Oil and Hazardous Substances Pollution Contingency Plan,” *Code of Federal Regulations*, as amended.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980,
42 U.S.C. 9601, et seq.

DOE-RL, 2002, *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions*,
DOE/RL-2001-41, Rev. 3, U.S. Department of Energy, Richland Operations Office,
Richland, Washington.

DOE-RL, 2007, *100-N Area Sampling and Analysis Plan for CERCLA Waste Sites*,
DOE/RL-2005-92, Rev. 0, U.S. Department of Energy, Richland Operations Office,
Richland, Washington.

Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*,
2 vols., as amended, Washington State Department of Ecology, U.S. Environmental
Protection Agency, and U.S. Department of Energy, Olympia, Washington.

EPA, 1999, *Interim Action Record of Decision for the 100-NR-1 and 100-NR-2 Operable Units*,
Hanford Site, Benton County, Washington, U.S. Environmental Protection Agency,
Seattle, Washington.

EPA, 2003, *Explanation of Significant Difference for the 100-NR-1 and 100-NR-2 Operable
Units, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency,
Seattle, Washington.

EPA, 2011, *Explanation of Significant Difference for the 100-NR-1 and 100-NR-2 Operable
Units, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency,
Seattle, Washington.

Resource Conservation and Recovery Act of 1976, 42 U.S.C. 6901, et seq., as amended.

WAC 173-340, “Model Toxics Control Act – Cleanup Regulation,” *Washington Administrative
Code*, January 1996.

WAC 173-340-720, “Groundwater Cleanup Standards,” *Washington Administrative Code*, 2003.

Figure 1. Location of the 100-NR-1 and 100-NR-2 Operable Units.

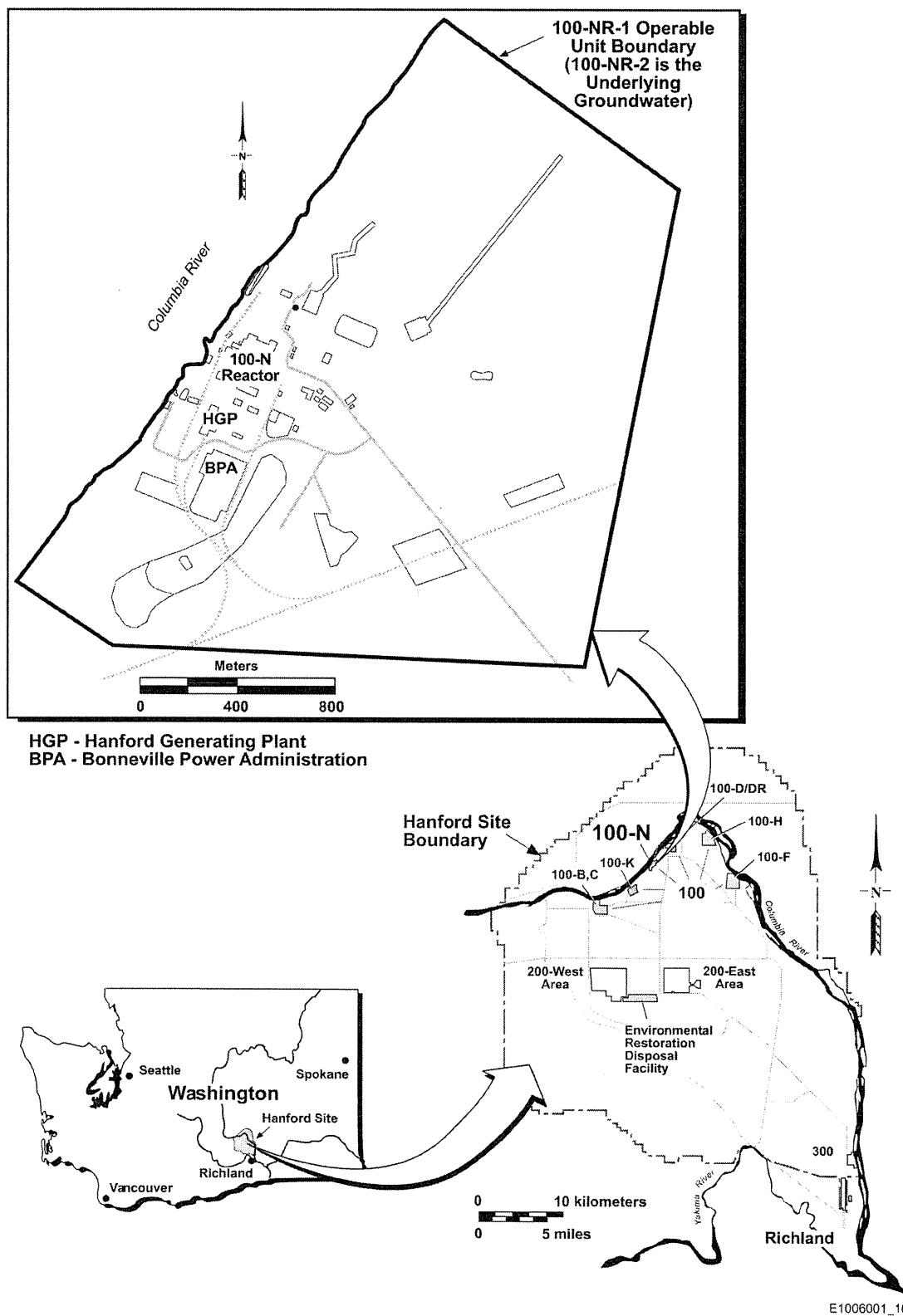


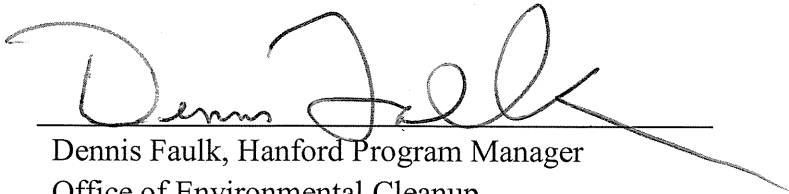
Table 1. Waste Sites Being Added to the 100-NR-1/NR-2 Interim Remedial Action Record of Decision.

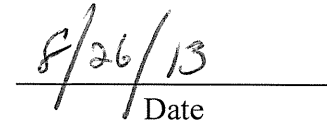
Operable Unit	Site Name	Current Site Knowledge/Comment	Media/Material	Known or Potential Contamination	Estimated Cost of Site Remediation
100-NR-1	100-N-79 Spillway ^a	The 100-N-79 spillway (also referred to as an "emergency outfall") is constructed of reinforced concrete and extends from the 1908-N outfall, under a service road, and discharges at the low water mark on the Columbia River shore 112 m (367 ft) from the outfall. The spillway was an emergency discharge point for the 1908-N outfall structure and received secondary cooling water from reactor operations. The concrete spillway and any contaminated underlying soil are included in the scope of this site.	Soil, concrete	Am-241, Cs-137, Co-60, Eu-152, Eu-154, Eu-155, Sr-90, Ni-63, C-14, U-233/234, U-235, U-238, Pu-238, Pu-239/240, Tritium, Chromium, Hexavalent chromium, Lead, Mercury and Polychlorinated byphenyls	\$317,000
100-NR-1	100-N-104, Raw Water Overflow Spillway	The 100-N-104 raw water overflow spillway was designed to collect the overflow and drainage from four water storage tanks into a 91-cm (36-in.) pipeline (100-N-61) and dispose of this waste water to the river. The four water storage tanks (1900-N) were an afterheat removal system storage tank, an emergency raw water storage tank, a filtered water storage tank, and a demineralized water storage tank. The system to collect this overflow and drainage was composed of an overflow and a drain pipeline from each of the water storage tanks, and a 30.5-cm (12-in.) raw water return line (100-N-61) from the 182-N Building. The effluent from the 91-cm (36-in.) line spilled into a sloped concrete chute, into a stilling basin, and thence to the river. This spillway received secondary cooling water from reactor operations. The concrete spillways and any contaminated underlying soil are included in the scope of this site.	Soil, concrete	Cs-137, Co-60, Sr-90, Arsenic, Chromium, Hexavalent chromium, Lead, Mercury, Chlorine and Sulfate	\$84,500

^a The 100-N-79 spillway waste site was originally included in the 100-N Area Ancillary Facilities Action Memorandum as a part of the 1908-N outfall, but was subsequently identified as a separate site in the Waste Identification Data System database. A portion of the 100-N-79 spillway was removed under the 100-N Ancillary Facilities Action Memorandum; approximately 10-m (33-ft) of spillway above the ordinary high water mark remains to be remediated under the Interim Action ROD.

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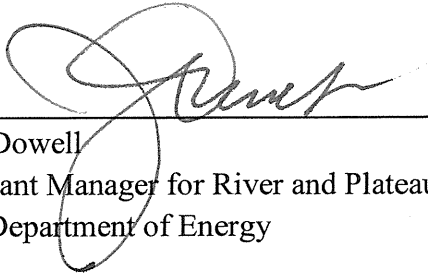
Signature sheet for the *Explanation of Significant Differences for the Interim Action Record of Decision for the 100-NR-1 and 100-NR-2 Operable Units* between the U.S. Department of Energy and U.S. Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.


Dennis Faulk, Hanford Program Manager
Office of Environmental Cleanup
U.S. Environmental Protection Agency, Region 10


Date

August 2013

Signature sheet for the *Explanation of Significant Differences for the Interim Action Record of Decision for the 100-NR-1 and 100-NR-2 Operable Units* between the U.S. Department of Energy and U.S. Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.



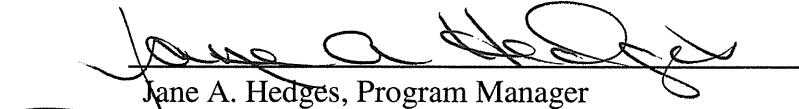
J. D. Dowell
Assistant Manager for River and Plateau
U.S. Department of Energy

8.21.13

Date

August 2013

Signature sheet for the *Explanation of Significant Differences for the Interim Action Record of Decision for the 100-NR-1 and 100-NR-2 Operable Units* between the U.S. Department of Energy and U.S. Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.


Jane A. Hedges, Program Manager
Nuclear Waste Program
Washington State Department of Ecology

8/29/13
Date